sport health

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Member survey

Lack of follow up
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Editors
John Orchard & Cristina Caperchione

Managing Editor
Amanda Boshier

Chief Executive Officer
Nello Marino

Subscription Manager
Brigid Doherty

Advertising Manager
Amanda Boshier

Design/Typesetting
Papercut

SMA STATE BRANCHES

Australian Capital Territory
ACT Sports House
100 Maitland St Hackett ACT 2602
T (02) 6247 5115

New South Wales
PO Box 3176 Rhodes NSW 2138
T (02) 8116 9815

Northern Territory
PO Box 2331 Darwin NT 0801
T (08) 8981 5362

Queensland
Sports House 150 Caxton St Milton QLD 4064
T (07) 3367 2700

South Australia
PO Box 219 Brooklyn Park SA 5025
T (08) 8234 6369

Victoria & Tasmania
Sports House
375 Albert Road South Melbourne VIC 3205
T (03) 9674 8777

Western Australia
PO Box 57 Clarement WA 6010
T (08) 9285 8033

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T (02) 8116 9815
E members@sma.org.au

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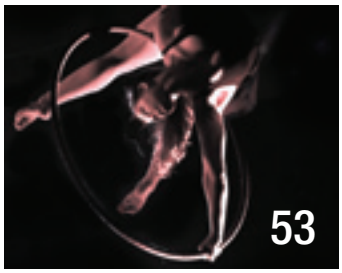

SMA Member research

And the results are…

Sports Medicine Australia is pleased to announce a new partnership with DJO Global, the leading global provider of high-quality, orthopaedic devices, with a broad range of products used for rehabilitation, pain management and physical therapy. Nello Marino is pictured with DJO Global's Compex Muscle Stimulator.

If you have a worthy cause or issue related to sports medicine or physical activity that you would like promoted in *Sport Health* via a promotional item, e.g. hat, t-shirt, mug, email nello.marino@sma.org.au

SMA CEO, Nello Marino, discusses the results of the recent SMA Member survey.

Members with an email address would have recently been invited to take part in an SMA member survey. The survey sought to provide SMA Management with a better understanding of why members join, why they stay members and why they allow their membership to lapse.

Almost 30% of invited members responded to the survey which we are delighted to learn is above industry standard for this type of research. This survey is the most extensive research conducted on the SMA membership for some years and will provide us with invaluable data to support the provision of improved and more tailored member services across the organisation in the future.

"Generally members are satisfied with their SMA membership. Seventy percent of members surveyed indicated that they were either satisfied (51%) or extremely satisfied (19%)."

But before any discussion of the research and the results, a huge thank you to each and every member who took the time to respond to the survey. The response rate is a very positive indication that there are many members who have a great passion for the organisation which is approaching its 50th year. Whilst the responses don't represent the views of the entire membership, the information will assist in shaping the services and benefits offered to members in the future.

All types of members were surveyed including full professionals, fellows, graduates, students, sports trainers and associates, and responses were generally proportionate to gender representation and membership representation across all States and Territories. Similarly representation from numerous professions reflective of SMA's multidisciplinary profile was also evident.

Generally members are satisfied with their SMA membership. Seventy percent of members surveyed indicated that they were either satisfied (51%) or extremely satisfied (19%). A mean score of 3.84 (out of five) would suggest that members generally rate their SMA membership as valuable.

"The three main reasons for joining were professional development/training (49.7%), access to resources/ educational material/information (46.9%) and finally conferences and events (42%)."

Reasons for joining SMA and continuing membership were wide and varied and respondents were offered 17 different options to respond with. The three main reasons for joining were professional development/training (49.7%), access to resources/educational material/information (46.9%) and finally conferences and events (42%). Interestingly these three options were also key reasons for membership continuation for most members.

Publications were also of great interest given the great number of contributions to our many and varied member publications. Most notably the two publications most read were *Sport Health* and the *Journal of Science and Medicine in Sport (JSAMS).* However the most valued publications were JSAMS and 'Resources' which includes the many and varied fact sheets. Whilst this is a positive response to JSAMS which recently

achieved an improved Impact Factor and ranking score (see page 68), it also suggests that many of our members are unaware of the information resources available to them.

Improvements to publications were also suggested. Most notably members sought more information specific to their area of 'interest' which would suggest either more discipline specific content or greater exploration of our members' interests is required.

"... a very large proportion of respondents (72%) indicated that they do not currently use the SMA logo on their website, business card or other similar branding opportunity."

SMA's online presence was also scrutinised and it is highlighted that this is an area requiring clear improvement. Most of the SMA National website features including content, navigation and look rated in the moderate to valuable range. However it is clear that a number of members feel this is an area of underperformance and requires improvement. This is particularly so in the 'member portal' and member directory areas of the site.

Our member benefits program was also an area in which the response was resounding. Member benefits, which include a number of third party products and services available to members at a discounted price, were generally unknown to members as reflected by low uptake and obvious low awareness. Again this is another area which will require significant review.

Finally a very large proportion of respondents (72%) indicated that they do not currently use the SMA logo on their website, business card or other similar branding opportunity.

Whilst the information presented in this article is not an exhaustive description of the results, they are an initial component of feedback to our members and the sports medicine community. More importantly it is what comes next that really counts and our readers can rest assured that the results will be used to forge a comprehensive membership strategy which will provide improved service and value to SMA members.

Most notably it is critical that we continue to alert, inform and provide every opportunity for members to advance their expertise and skills. We will use the information to develop a comprehensive membership retention, recruitment and fulfilment strategy, however in the short term we anticipate some fairly prompt action particularly in the area of professional development and improved exposure and accessibility to SMA resources.

Follow SMA CEO Nello Marino on Twitter @smaceo

Sports Medicine Australia says importance of trained sport personnel highlighted by tragic rugby union on field accident **http://t.co/KbHI5DK** – July 18, 2011

Sports injury accounts for more than twice the number of hospital treated injuries than road traffic accidents **http://t.co/ctiplqx** – June 28, 2011

SMA is calling on all major ski resorts to implement a mandatory helmet policy for ski instructors, to improve safety **http://t.co/V0wu4kO** – June 28, 2011

Great concussion article by Sam Lane highlights the pressure felt by all athletes with injuries **http://t.co/L0wPJxB** – June 26, 2011

Most afterschool activities undertaken by 10–14 year olds are sedentary with TV topping the list, a JSAMS study shows **http://t.co/b2fT9eR** – June 22, 2011

Shane Brun from SMA says link between migraine, i.e. Wallaby Berrick Barnes and continuous blows to the head is cloudy **http://t.co/Gg62oEw** – June 15, 2011

The harder NRL rugby league players train, the more injuries they will sustain, according to a recent JSAMS study **http://bit.ly/mjcJjX** – June 7, 2011

Attention Sports Medicine Australia members. June 2011 member benefits now available. Check out **http://bit.ly/ioUxcl** – June 3, 2011

Know your football codes? Podcast with Aaron Coutts-Sports Science Advisor, Carlton FC and Paramatta Eels **http://bit.ly/bMtVwy** – June 2, 2011

Winter is here! SMA encourages correct cold weather preparation to prevent winter sports injuries **http://bit.ly/me9cOQ** – June 1, 2011

We appreciate the effort that our members have made to provide the necessary feedback to critically inform us of our strengths, weaknesses and the opportunities that these present us in the future.

Nello Marino

Chief Executive Officer
Sports Medicine Australia
nello.marino@sma.org.au

5 mins with… Mark Brown

Sports Physiotherapist and SMA QLD Executive Officer

What is your profession?

I am a Sports Physiotherapist, though I also have tertiary qualifications in Business and Management.

How many years have you been in this profession?

I completed my undergraduate degree in Physiotherapy in 1982 and worked primarily as a clinician until 1996. In 1996 I started working for the Australian Physiotherapy Association until 2004 when I moved to Queensland and took up my current position with Sports Medicine Australia. Though both of these jobs were/are primarily administrative, I've maintained some clinical physiotherapy work and more recently began teaching physiotherapy.

Where do you work?

My main job is as the Executive Officer of the Sports Medicine Australia Queensland Branch (SMA QLD), though with the disappointing elimination last year of funding from the State Government (that SMA QLD used to receive) and the resulting restructure I have started doing some work for the SMA National Office. I also have a part-time adjunct position with the Faculty of Health Sciences and Medicine at Bond University.

What does your typical day consist of?

Given that the role of a not-for-profit organisation manager has many components I'm not sure there is such a thing as a typical day! Primarily though my job is to make sure the SMA strategic plan, as set by the Board of Directors, is executed effectively and efficiently. I also spend a lot of my time either meeting with people from sporting, health or education organisations and providing advice about safer sport and physical activity via phone/email.

What is your favourite aspect of your job?

I love that what SMA does improves people's health and wellbeing and that this has positive effects for individuals and society as a whole. The fact that we can institute recommendations and strategies that have an increasingly strong evidence base for their effectiveness makes this even more satisfying.

What has been the highlight of your career?

Being appointed as the Director of Physiotherapy for the Sydney 2000 Olympic and Paralympic Games. While this was nominally a part-time role, and unpaid I hasten to add, it was a vast undertaking that stretched me to my limits but ultimately was immensely satisfying. Over a period of 8 weeks 530 volunteer physiotherapists provided just under 5,000 treatments across 63 different venues to visiting athletes without any adverse outcomes, and in fact received huge praise for the quality of care and commitment of all who were involved. It was a very proud time and spoke volumes for the skills and character of Australian physiotherapists.

When, why and how did you become involved with SMA?

I started attending SMA courses/conferences and reading SMA publications in 1983, straight after graduation, because I soon realised what I had learned in my physiotherapy degree was not enough to make me a good sports medicine practitioner. The SMA multi-disciplinary approach was vitally useful in gaining knowledge about other aspects of sports medicine. Additionally, the networking SMA provided was pivotal in making enduring connections that resulted in securing both work experience and paid work with sporting teams initially which I was then able to build on, especially later.

Tell us about your work with SMA courses.

Currently I am involved in delivering the SMA Safer Sport Program courses to the local community and in addition am involved in the development of a course in conjunction with the IOC for physiotherapists from the Oceania region. One of the great things about the Olympics is the commitment to providing an enduring legacy, in this case by improving the skills and knowledge of physiotherapists from developing countries, who in turn can institute more effective sports injury prevention and management strategies in their local communities. Another area I'm involved in is the development of a delivery model or models for the new Certificate III Sports Trainer qualification that has recently been endorsed as a new qualification under the Australian Qualification Framework, including how this qualification will fit in with SMA Sports Trainer accreditation.

What are you passionate about?

Doing things, whether they be career, hobbies or family activities. My motto is that life is not a spectator sport and I've tried to live that by having a go at a lot of different things. As well as greatly enjoying sport and physical activity I'm also passionate about playing music and have been involved in various bands and music groups most of my life. I also am very interested in anthropology, history and archaeology.

What's the best piece of advice anyone has ever given you?

Unfortunately I mustn't have been listening at the time because I can't remember anything at the moment!

Name four people, living or not, you would invite for a dinner party and why?

Too hard, but one would be Dennis Lillee, my cricket hero and my inspiration for wanting to be a fast bowler which resulted in registering myself for cricket when I was 13. Later on he became someone I often refer to when talking about what sports medicine and sports science can achieve, given how important this was in his career after his injury. Maybe Paul Keating, too, along with someone he didn't like or agree with to see what he would come up with in conversation.

Favourites

Travel destination: Anywhere in Australia, the best country on the planet. I also love visiting my wife's homeland of Cyprus, and also the UK.

Sport to play/watch: Cricket was my main sport and I played it for 30 years. I LOVE watching test cricket and make no apologies for that, most people don't get it but having played the game I do. Other sports I've competed in include soccer, hockey, judo, tennis and motocross.

Cuisine: Greek, Italian, Indian, Mexican, and most of the others!

Movie: Blade Runner.

Song: 40 by U2.

Book: The Grapes of Wrath by John Steinbeck.

Gadget: I just got an iPad2 and so far I think it's great.

SPORTS MEDICINE AUSTRALIA

ARE YOU TAKING FULL ADVANTAGE OF YOUR SMA MEMBERSHIP?

"My career in sports medicine has been significantly **ENHANCED** by the great **KNOWLEDGE, NETWORKING** and professional **SUPPORT** that **SMA** provides."

Trish Wisbey-Roth, SMA Member
Olympic and Specialist Physiotherapist, Bounce Back

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- **SMA** membership **KEEPS YOU INFORMED** of the latest industry news via *Sport Health* magazine, the *Journal of Science and Medicine in Sport* and the SMA Member e-news.

- **SMA** membership **PROVIDES YOU WITH NETWORKING OPPORTUNITIES** and maximises interdisciplinary referral and information exchange opportunities by being an active participant at many of the industry's finest conferences/events.

- **SMA** membership **MAXIMISES YOUR EXPOSURE** through the SMA online Member Directory and other advertising opportunities.

- **SMA** membership **PROTECTS YOUR INTERESTS AND FUTURE** by supporting the industry's peak multidisciplinary body. SMA lobbies government, provides representation and advice, develops policies and guidelines and actively promotes the industry in the media.

- **SMA** membership **SAVES YOU MONEY** by offering the Member Benefits program, discounted education opportunities and many useful resources.

To make the most of your SMA membership visit sma.org.au

Lack of follow-up –

The biggest problem of our health system

Dr J explores the shortcomings and challenges associated with following up patients within our sports medicine system.

In Australia, we like to think we are home to world's best standard of sports medicine. We do have some objective evidence to support this proposition, like our research output in international sports medicine journals and conferences. We can also now (finally) lay claim to a recognised four year full-time medical specialty training program in sport and exercise medicine. We also like to think our sports medicine clinical management is amongst the world's best. In this sense we have something in common with the Americans (...an arrogance that we are the world leaders in sports medicine).

It isn't actually the only thing we have in common with them. In the field of sports medicine, both Australia and the US have a thriving fee-for-service private sector. In the US, the public sector is almost non-existent, whereas in Australia the public sector basically does not engage with the specialty of sport and exercise medicine.

"The evidence-based-medicine purists may claim that observational follow-up studies... are not all that valid for determining whether a treatment is helpful..."

"...'lack of follow-up' is an almost universal failing of all fee-for-service health systems..."

In Australia, the public system will fully treat approximately 1% of sport and exercise medicine cases on the basis that they are major trauma/emergency cases and expect that the patient will organise their own treatment for the other 99% of cases.

This is one of the massive structural reforms our health system will need over the next few years. There is an enormous excess health burden (heart disease, stroke, cancer, depression, osteoporosis) due to lack of exercise, yet those who do exercise are often treated as outcasts by the public system if they are unfortunate enough to be injured while doing the right thing (i.e. exercising). If you are only injured (but not dying) you get downgraded to the end of the five hour queue in the Emergency Department and then told that your X-ray is normal and you must leave and seek treatment elsewhere (with the 'where' not provided by the public system). Those of us in the private sector are in some ways the beneficiaries of this neglect in that the public sector does not even attempt to provide a free sports medicine service at a baseline level to act as competition for the private sector.

We view the so-called excellence of our system through the prism of our own perspective: if you come to 'our' clinic with, say, a knee injury, you will get excellent service. We think that the middle class person in Australia with a knee injury gets excellent service (...if they come to 'our' sports medicine centre). Very little consideration is given to the person who gets a knee injury who genuinely can't afford private health insurance or private clinic fees. How excellent does Australia's sports medicine system look to them? How many New Zealand immigrants wish they were back in their homeland when they injure their knee in Australia and find out they'll have to come up with thousands of dollars to try to fix it (when it would have all been free back 'home')?

"In this sense we have something in common with the Americans (...an arrogance that we are the world leaders in sports medicine)."

The poor quality of the Australian 'public' sports medicine system is not in any doubt, but is our private system as good as it makes out? In the majority of cases it is probably world class (in my opinion). However it is user-pays fee-for-service. If you scrape together the $3,000 you might need to get your knee fixed in the private system (which could be the bargain basement total price if uninsured but also could be the 'gap' amount even if insured), will it actually be money well spent? The answer is 'maybe' and in trying to assess whether your investment in private sports medicine care would actually be money well spent, you quickly come across the biggest weakness of our system – lack of systematic follow-up. A reason we have to explain this – but perhaps not an excuse – is that 'lack of follow-up' is an almost universal failing of all fee-for-service health systems not just the Australian sports medicine one.

"Those of us in the private sector are in some ways the beneficiaries of this neglect..."

The evidence-based-medicine purists may claim that observational follow-up studies (cohorts and case series) are not all that valid for determining whether a treatment is helpful, because there is a selection bias in who received treatment. In the real world, I would argue that you need a combination of Randomised Controlled Trials (RCTs) and observational studies to properly evaluate a treatment.

"...is it less ethical to enquire about success rates than to ignore them altogether (which is what happens 95% of the time in a fee-for-service system)?"

RCTs have their own problems as well, being expensive to conduct (and with bias potentially being associated with the funding body) and often only being able to study a particular type of patient or circumstance that may not be able to be generalised.

In the orthopaedic/sports medicine field, there have been RCTs over the past decade showing that knee arthroscopy for knee osteoarthritis/chondral damage fails to beat conservative care or even placebo surgery. Yet despite the dismal RCT results, there has been no suggestion of limiting funding for knee arthroscopy for osteoarthritis under Medicare (or alternate funding of treatment which may get better results). In fact the incidence of knee arthroscopy has steadily increased in Australia over the past decade despite one of the major indications being

discredited by RCTs. Those knee surgeons who still perform arthroscopy for chondral damage and osteoarthritis will claim that the particular indications that they are operating for, on average, lead to better results than non-surgical treatment. At least they should be claiming this; otherwise they should not be performing the surgery in the first place! In trying to work out the validity of this claim, it is impractical to conduct a huge number of RCTs (e.g. RCT for chondral lesions on the lateral femoral condyle in highly active female patients under 40 with knee effusion but full range of motion). There are so many variables that a RCT taking all of them into account is impractical, yet if you don't assess all of them, you leave the window open for surgeons to argue "in this circumstance I am convinced that knee arthroscopy is helpful, and the RCTs haven't studied this particular circumstance".

"...despite the dismal RCT results, there has been no suggestion of limiting funding for knee arthroscopy for osteoarthritis under Medicare..."

The practical solution is to strongly encourage (and eventually mandate?) follow-up of patients. If the real life observational follow-up results for, say, knee arthroscopy in cases of chondral damage, are equally as dismal as the RCT results, then the procedure should actually not be funded by health systems. If the observational results show circumstances where the patients are getting better results in medium-term follow up than similar patients who don't choose surgery, then the operation probably still has some validity.

So how easy is it to achieve a reasonable follow-up of patients in the medium term? In this issue of *Sport Health,* an international medical student of mine presents results of a study we conducted to compare the follow-up rate of a mailout pen and paper questionnaire to using email and an internet site to complete a survey.

The procedure we chose to follow-up results for was shock wave (mainly for plantar fasciitis and calcific Achilles tendinopathy). There have been multiple RCTs showing a benefit for shock wave over placebo for these conditions, although interestingly Medicare doesn't fund the treatment.

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"So, in a fee-for-service system, where you get paid for performing a treatment, but it costs you lots of money to do high-end internet follow-up, how many practitioners are going to attempt the follow-up?"

The study was far more difficult to conduct than we expected. The first barrier was the ethics committee. Even though this was a non-interventional observational study protocol, the ethics committee initially had many concerns with the study. The most interesting concern was a question asked by the ethics committee – "What are you going to do for the patients who report that the treatment didn't work for them (and that they still have pain)?" The answer, sadly, was that from the study viewpoint we weren't trying to treat/help any specific individual – we just wanted to try to move in the direction of better patient follow-up which might lead to more appropriate treatment of all patients in the future. I can see why the ethics committee would ask this question, and in an ideal world we could address this. But is it less ethical to enquire about success rates than to ignore them altogether (which is what happens 95% of the time in a fee-for-service system)?

We finally made it through ethics (with a struggle) but came across even bigger hurdles during the study itself. In the study (which was self-funded) about $500 was spent on mailing and printing questionnaires and about $3,000 was spent on designing a web interface for the questionnaire, in addition to the many (unpaid) hours working on the project. The website was an unmitigated disaster. It took much longer than expected for the work to get completed, there were large number of bugs at many stages and then, when our initial large batch of requests to patients were sent out, someone from the web design company managed to wipe out the entry page of the site so that no one could log in for two weeks.

"The poor quality of the Australian 'public' sports medicine system is not in any doubt, but is our private system as good as it makes out?"

We persisted to a degree but have reported that, in our environment, a mailout pen and paper questionnaire gave far more satisfactory results than a website interface, despite more money being spent on the latter.

What is the lesson learnt from this? The technology is available to do it properly using the internet, but it was probably naive to think that for $3,000 there was enough resourcing to get the website fully functional in an ongoing sense. Google and Facebook don't crash because there are millions spent keeping their servers alive and bug-free. So, in a fee-for-service system, where you get paid for performing a treatment, but it costs you lots of money to do high-end internet follow-up, how many practitioners are going to attempt the follow-up?

Particularly if you are on a lovely earner through our health system doing, say, knee arthroscopies for chondral damage, and you have a sneaking suspicion that maybe the RCTs are right and your lucrative procedure isn't leading to net positive results. I have used the example of knee arthroscopy for chondral damage, but the same logic applies to less invasive procedures like cortisone injections for tennis elbow. The RCTs are reporting poor long-term results, yet there is no onus on practitioners who give these injections to do any follow-up and show that their results justify the procedure. Medicare doesn't fund unguided injections, but will give a rebate for an ultrasound-guided injection of cortisone for tennis elbow. The majority of ultrasound-guided injections are done by radiologists, a group of specialists who often don't offer review consultations, but are still funded for the procedure.

"It is altruistic to want to get better with follow-up, but it makes the decision easier if it also helps maintain your practice."

There are some good examples of long-term follow-up studies in Australia that are proving to be cost effective. Leo Pinczewski has done up to 15 year follow-up studies of a large cohort of his ACL reconstructions. This has been an expensive undertaking (requiring him to finance full-time research assistants) but in the big picture he would have had a return on his investment. Leo is a very high volume knee reconstruction proceduralist, and the fact that he has multiple publications on the follow-up he has undertaken drives ongoing referrals. It is altruistic to want to get better with follow-up, but it makes the decision easier if it also helps maintain your practice. The AOA joint replacement register is also a major success story with respect to long-term follow-up. This is funded and mandated by government (as it should be, to stay independent from the device manufacturers) and *in vivo* it is working well when prostheses with poor results get removed from the market.

Ultimately the big ticket system reform would be that any practitioner getting substantial funding from Medicare/private health for a particular procedure would need to demonstrate adequate follow-up of results (or contribution to a register) in order to keep receiving the rebate. This would be a bit like the cost-benefit approach applied for pharmaceuticals to receive PBS listing. If my patients were drawing on Medicare rebates for shock wave (which they're not, as it is not currently funded) and these rebates were contingent on getting adequate follow-up results, then I might be prepared to spend the many additional thousands of dollars following through on a working internet-based system for patient follow-up. At the moment, though, I have bailed out on trying to get the follow-up website working as a long term venture. Some people would suggest that I should insist on asking for money back from the website developers, for providing a product that didn't properly do what I paid for. For the $3,000 spent on it, you would like to think that a website wouldn't crash. But when I work and profit in a medical system where people regularly spend $3,000 on a knee operation that doesn't work, and they aren't entitled to their money back, it would be a bit rich for me to force the issue.

Dr J

The opinions expressed in Dr J are the personal opinions of the author.

Injury Report 2010: Australian Football League

AFL Photos.

The AFL has conducted and published an annual injury survey every season since 1992[1,4–10], making it the longest-running sports injury surveillance system in Australia and professional sport. This survey has enabled the capture of 100 per cent of defined injury episodes ('any injury or other medical condition that prevents a player from participating in a regular season (home and away) or finals match') since 1997[3,16]. Following is the 19th annual AFL Injury Report containing injury data from the 2010 season.

"The injury incidence... for 2010 was the highest.... it has been in the last decade."

Results

Key indicators for the past 12 years are shown in Table 1. The injury incidence (number of new injuries per club per season) for 2010 was the highest (38.6 new injuries per team per season) it has been in the last decade. Injury prevalence was the highest it has been since 1997 and continued the upward trend since 2003. Despite these increases, the rate of recurrent injuries (4.7 per team per season or 12%) was close to the long-term average.

Injury incidence

Table 2 (overleaf) details the incidence of the major injury categories. Notable findings to report for injury incidence in 2010 include a higher than usual incidence of groin strains/osteitis pubis and ankle sprains. However, the vast majority of injury categories exhibited incidence close to or slightly above the long-term (10 year) average.

Table 1 – Key indicators for all injuries over the past 10 seasons*

All injuries	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
Incidence (new injuries per club per season)	35.8	34.4	34.1	34.8	35.3	34.0	34.7	36.9	37.8	38.6	35.6
Incidence (recurrent)	5.5	4.4	4.6	3.7	4.8	4.1	5.6	5.4	3.6	4.7	4.6
Incidence (total)	41.3	38.7	38.7	38.5	40.1	38.2	40.3	42.3	41.4	43.3	40.3
Prevalence (missed games per club per season)	136.4	134.7	118.7	131.0	129.2	138.3	147.1	147.1	151.2	153.8	138.8
Average injury severity (number of missed games)	3.8	3.9	3.5	3.8	3.7	4.1	4.3	4.0	4.0	4.0	3.9
Recurrence rate	15%	13%	14%	11%	14%	12%	16%	15%	10%	12%	13%

* For this and other tables, results are reported to a fixed number of decimal places and therefore some columns may appear to not add up correctly due to rounding.

Table 2 – Injury incidence (new injuries per club per season)

Body area	Injury type	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 year average
Head/neck	Concussion	0.7	0.7	0.3	0.3	0.7	0.3	0.3	0.4	0.5	**0.5**	0.5
	Facial fractures	0.4	0.4	0.6	0.8	0.6	0.3	0.4	0.2	0.5	**0.5**	0.5
	Neck sprains	0.1	0.0	0.0	0.1	0.2	0.3	0.1	0.2	0.1	**0.1**	0.1
	Other head/neck injuries	0.3	0.2	0.3	0.2	0.1	0.2	0.2	0.1	0.1	**0.2**	0.2
Shoulder/ arm/elbow	Shoulder sprains and dislocations	1.1	0.9	1.3	1.0	1.4	1.6	1.0	1.8	1.3	**1.6**	1.3
	A/C joint injuries	0.9	1.1	0.3	1.1	0.8	1.2	0.8	0.7	0.5	**0.8**	0.8
	Fractured clavicles	0.3	0.3	0.2	0.6	0.3	0.3	0.3	0.1	0.2	**0.2**	0.3
	Elbow sprains or joint injuries	0.2	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.2	**0.2**	0.1
	Other shoulder/arm/elbow injuries	0.5	0.8	0.5	0.4	0.6	0.3	0.2	0.3	0.1	**0.3**	0.4
Forearm/ wrist/hand	Forearm/wrist/hand fractures	0.8	1.1	0.8	1.1	1.3	1.1	0.9	1.2	1.1	**1.2**	1.1
	Other hand/wrist/forearm injuries	0.3	0.4	0.7	0.4	0.3	0.3	0.6	0.4	0.4	**0.3**	0.4
Trunk/back	Rib and chest wall injuries	0.4	0.9	0.8	0.7	0.4	1.0	0.4	0.7	0.3	**0.6**	0.6
	Lumbar and thoracic spine injuries	1.4	0.9	0.8	1.6	2.1	1.5	1.3	1.5	1.4	**1.7**	1.4
	Other buttock/back/trunk injuries	0.5	0.4	0.5	0.6	0.4	0.6	0.5	0.7	0.5	**0.4**	0.5
Hip/groin/ thigh	Groin strains/osteitis pubis	3.5	3.8	2.9	3.1	2.9	3.3	4.1	3.2	3.3	**4.1**	3.4
	Hamstring strains	6.0	4.4	5.7	6.3	5.2	6.4	6.7	6.6	7.1	**6.0**	6.1
	Quadriceps strains	1.6	1.7	2.0	1.9	1.9	1.7	1.8	1.8	2.1	**1.7**	1.8
	Thigh and hip haematomas	0.6	1.0	0.3	1.1	1.0	1.1	0.6	0.5	1.0	**1.1**	0.8
	Other hip/groin/thigh injuries, including hip joint	0.3	0.3	0.4	0.3	0.2	0.3	0.8	0.8	1.0	**0.7**	0.5
Knee	Knee ACL	0.9	0.8	0.6	0.5	0.6	0.9	0.6	0.9	0.7	**0.6**	0.7
	Knee MCL	1.2	0.9	1.0	0.7	1.0	0.8	1.4	1.3	0.7	**0.8**	1.0
	Knee PCL	1.0	0.4	0.5	0.7	0.4	0.3	0.2	0.3	0.3	**0.4**	0.4
	Knee cartilage	1.9	1.3	1.7	1.2	1.3	1.0	1.2	1.6	2.0	**1.7**	1.5
	Patella injuries	0.2	0.4	0.1	0.1	0.3	0.3	0.3	0.2	0.2	**0.5**	0.2
	Knee tendon injuries	0.5	0.8	0.7	0.4	0.7	0.4	0.3	0.3	0.5	**0.4**	0.5
	Other knee injuries	0.8	0.5	0.7	0.7	0.9	0.2	0.8	1.0	1.0	**0.4**	0.7
Shin/ankle/ foot	Ankle joint sprains, including syndesmosis sprains	2.0	2.5	2.6	2.5	2.5	2.1	2.2	2.5	2.6	**3.3**	2.5
	Calf strains	1.6	2.2	1.6	0.9	1.9	1.6	1.2	2.0	1.3	**1.7**	1.6
	Achilles tendon injuries	0.2	0.4	0.4	0.2	0.3	0.3	0.4	0.6	0.6	**0.4**	0.4
	Leg and foot fractures	1.0	0.8	0.5	0.5	0.4	0.7	0.5	0.5	1.0	**0.9**	0.7
	Leg and foot stress fractures	0.9	0.7	0.9	0.9	0.9	1.1	1.1	0.9	0.9	**1.2**	1.0
	Other leg/foot/ankle injuries	1.7	0.8	1.5	1.7	1.3	1.5	1.3	1.1	1.5	**1.7**	1.4
Medical	Medical illnesses	1.8	2.3	2.4	2.0	2.2	0.7	1.9	2.1	2.9	**2.1**	2.0
Non-football injuries, including pre-existing		0.2	0.3	0.4	0.1	0.1	0.2	0.2	0.3	0.2	**0.5**	0.2
NEW INJURIES/CLUB/SEASON		35.8	34.4	34.1	34.8	35.3	34.0	34.7	36.9	37.8	**38.6**	35.6

Injury recurrence

Table 3 and Figure 1 show the rate of recurrence of some of the common injury types which are prone to high recurrence rate. Most contact-mechanism injuries, such as fractures, concussions and 'cork' injuries have a low recurrence rate. The rate of injury recurrence has been showing a fairly steady decline over the last 10 years, with all of the common muscle strains showing a steady decline in recurrence rate[38]. Across the board there has been a trend for team medical staff to be more conservative with injury management (slower return to play and fewer recurrences).

Weekly player status and injury prevalence

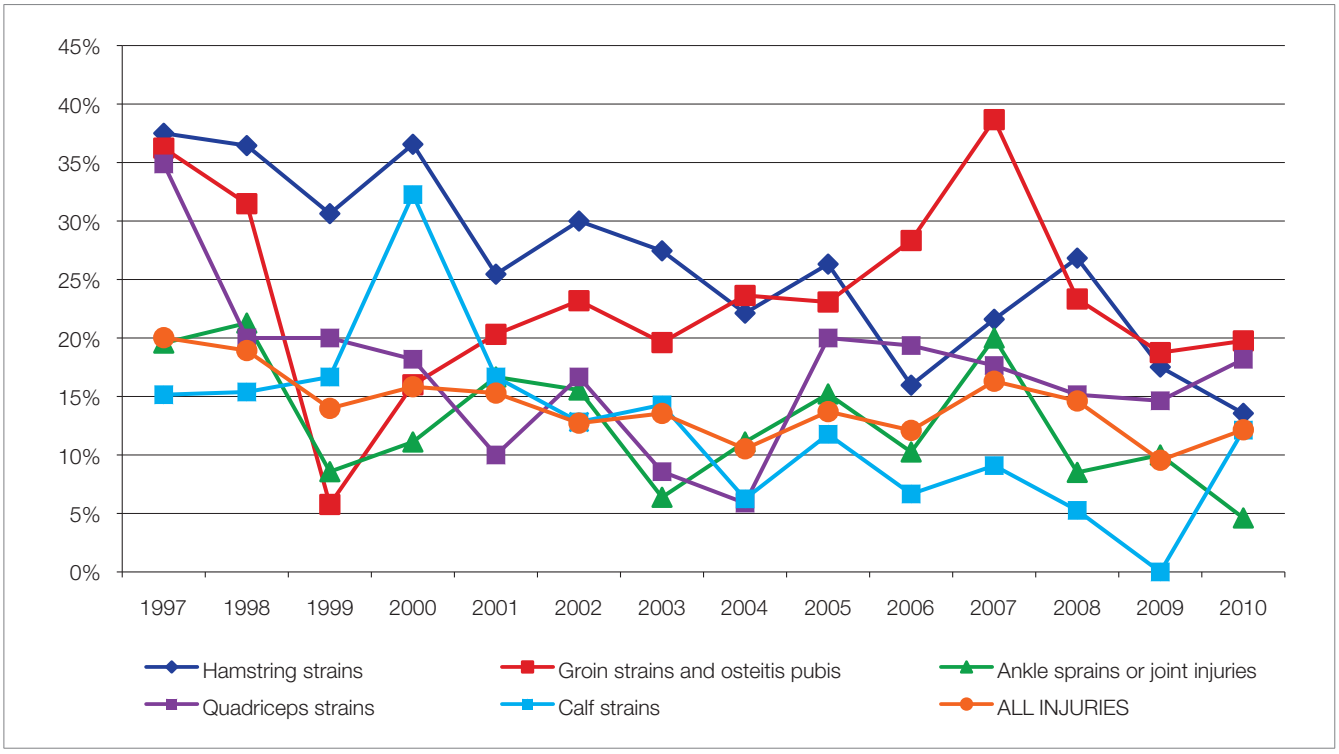
Table 4 (overleaf) details player status on a weekly basis over the past 10 seasons. The 'average' status of a club list of 46 players in any given week for 2010 was:

- 35 players playing football per week, 22 in the AFL.
- 8 missing through injury.
- 3 missing through other reasons (such as suspension, being used as a travelling emergency, team bye in a lower grade, etc).

Table 3 – Recurrence rates (recurrent injuries as a percentage of new injuries)

Recurrence rates	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 year average
Hamstring strains	25%	30%	27%	22%	26%	16%	22%	27%	18%	14%	23%
Groin strains and osteitis pubis	20%	23%	20%	24%	23%	28%	38%	23%	19%	20%	24%
Ankle sprains or joint injuries	17%	16%	6%	11%	15%	10%	20%	9%	10%	5%	12%
Quadriceps strains	10%	17%	9%	6%	20%	19%	18%	15%	15%	18%	15%
Calf strains	17%	13%	14%	6%	12%	7%	9%	5%	0%	12%	9%
All injuries	15%	13%	14%	11%	14%	12%	16%	15%	10%	12%	13%

Figure 1 – Recurrence rates (recurrent injuries as a percentage of new injuries)



AFL Photos.

Table 4 – Average weekly player status by season

All injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Playing AFL	21.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Playing lower grade football	11.8	11.4	11.4	11.3	12.9	12.1	12.0	11.9	12.2	11.8	11.9	11.7	12.8	12.8
TOTAL playing	32.8	33.4	33.4	33.3	34.9	34.1	34.0	33.9	34.2	33.8	33.9	33.7	34.8	34.8
Not playing because of injury	7.7	6.7	6.4	6.2	6.7	6.6	5.7	6.4	6.4	7.0	7.4	7.4	7.9	8.1
Not playing for other reasons	1.9	1.6	1.8	1.8	1.8	2.3	2.5	2.5	2.8	3.1	2.9	3.4	3.5	3.5
TOTAL not playing	9.6	8.3	8.3	8.0	8.5	8.9	8.2	8.9	9.1	10.1	10.4	10.8	11.4	11.6
Players in injury survey (per club)	42.3	41.7	41.7	41.4	43.4	43.0	42.2	42.8	43.3	43.9	44.2	44.6	46.1	46.4
Injury prevalence (%)	18.1%	16.1%	15.4%	15.0%	15.5%	15.3%	13.5%	14.9%	14.7%	15.9%	16.8%	16.7%	17.2%	17.5%

Table 5 – Injury prevalence (missed games per club per season)

Body area	Injury type	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 year average
Head/neck	Concussion	1.3	2.0	0.6	0.3	0.9	0.3	0.3	0.5	0.7	**0.8**	0.8
	Facial fractures	1.3	1.4	1.0	2.2	1.4	0.8	0.7	0.5	1.1	**1.4**	1.2
	Neck sprains	0.2	0.0	0.0	0.6	0.3	0.3	1.1	1.1	0.1	**0.1**	0.4
	Other head/neck injuries	1.5	0.2	0.7	0.2	0.2	1.1	1.6	0.1	0.3	**1.3**	0.7
Shoulder/ arm/elbow	Shoulder sprains and dislocations	5.4	5.9	5.7	5.9	7.7	10.8	6.4	10.2	7.7	**10.9**	7.7
	A/C joint injuries	2.1	2.4	0.7	2.5	1.9	2.7	1.4	1.5	1.2	**1.5**	1.8
	Fractured clavicles	1.6	2.0	1.0	3.5	1.3	1.7	1.8	1.1	0.6	**0.7**	1.5
	Elbow sprains or joint injuries	0.4	0.3	0.4	0.7	0.4	0.7	0.8	0.5	1.5	**0.2**	0.6
	Other shoulder/arm/elbow injuries	1.3	3.4	1.6	1.6	2.4	1.7	0.7	0.7	1.0	**0.3**	1.5
Forearm/ wrist/hand	Forearm/wrist/hand fractures	2.7	3.1	2.5	3.9	3.8	4.3	2.3	3.2	4.8	**3.4**	3.4
	Other hand/wrist/forearm injuries	0.3	2.2	2.9	1.2	1.2	0.5	3.1	1.4	0.8	**1.1**	1.5
Trunk/back	Rib and chest wall injuries	0.7	1.5	1.7	1.3	0.6	2.2	1.9	1.3	0.6	**1.3**	1.3
	Lumbar and thoracic spine injuries	5.6	5.8	2.1	5.4	6.4	5.4	2.8	5.0	4.6	**6.9**	5.0
	Other buttock/back/trunk injuries	1.5	1.6	1.6	2.3	0.7	1.3	1.7	1.3	1.2	**1.0**	1.4
Hip/groin/ thigh	Groin strains/osteitis pubis	13.6	15.7	13.7	13.3	11.2	14.0	18.0	12.4	11.7	**15.3**	13.9
	Hamstring strains	21.3	15.6	18.6	21.6	18.6	21.8	24.3	25.8	21.8	**20.6**	21.0
	Quadriceps strains	3.8	4.3	6.0	4.2	6.4	5.5	5.6	6.5	8.4	**6.3**	5.7
	Thigh and hip haematomas	0.6	1.9	0.5	1.7	1.6	1.4	1.0	0.6	1.2	**1.9**	1.2
	Other hip/groin/thigh injuries, including hip joint	1.7	1.2	1.5	2.6	1.0	2.3	4.5	3.4	6.9	**4.7**	3.0
Knee	Knee ACL	13.6	15.3	10.8	10.1	9.3	14.1	15.1	15.3	11.1	**7.8**	12.3
	Knee MCL	4.8	2.8	2.9	2.9	3.0	1.7	4.7	4.0	2.3	**2.5**	3.2
	Knee PCL	5.9	2.3	2.0	6.5	2.7	1.8	1.6	2.2	1.2	**3.2**	2.8
	Knee cartilage	12.5	6.0	7.0	6.1	7.8	5.7	9.1	8.5	10.7	**13.0**	8.6
	Patella injuries	0.8	2.5	0.6	0.1	0.8	1.2	2.7	1.0	1.8	**2.4**	1.4
	Knee tendon injuries	2.5	3.7	2.9	0.9	2.6	1.8	0.7	1.1	0.8	**0.8**	1.9
	Other knee injuries	2.5	1.0	2.4	1.3	3.8	0.2	2.6	2.7	2.6	**0.9**	2.0
Shin/ankle/ foot	Ankle joint sprains, including syndesmosis sprains	4.3	5.9	5.3	6.4	9.2	8.1	7.1	7.0	8.9	**9.2**	7.2
	Calf strains	3.4	4.4	3.8	1.7	4.5	3.4	3.1	4.4	3.0	**3.7**	3.5
	Achilles tendon injuries	0.7	0.9	1.5	0.8	1.9	2.1	2.2	4.1	2.2	**3.4**	2.0
	Leg and foot fractures	7.0	7.9	2.9	3.7	2.7	5.7	2.7	3.2	7.5	**7.6**	5.1
	Leg and foot stress fractures	4.4	3.9	5.3	6.3	5.1	8.2	6.8	7.3	11.0	**8.5**	6.7
	Other leg/foot/ankle injuries	4.2	2.3	3.7	4.3	4.2	4.1	4.2	4.6	6.8	**5.7**	4.4
Medical	Medical illnesses	2.6	2.9	3.8	4.2	3.6	0.7	3.1	3.5	3.7	**3.2**	3.1
Non-football injuries, including pre-existing		0.3	2.4	1.0	0.4	0.1	0.5	1.4	1.1	1.3	**2.4**	1.1
MISSED GAMES/CLUB/SEASON		136.4	134.7	118.7	131.0	129.2	138.3	147.1	147.1	151.2	**153.8**	138.8

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"Hamstring injuries remain the number one injury in the game..."

Table 5 (previous page) details the amount of missed playing time attributed to each injury category. Hamstring injuries remain the number one injury in the game with respect to missed playing time, surpassing both groin injuries and knee anterior cruciate ligament (ACL) injuries. Based on injury prevalence (missed playing time), these three categories are generally the highest categories for injury prevalence. ACL injuries exhibited lower than usual prevalence in 2010 whereas groin injuries, shoulder injuries and knee cartilage injuries exhibited higher than usual prevalence.

Analysis and discussion for significant injury categories

Hamstring injuries

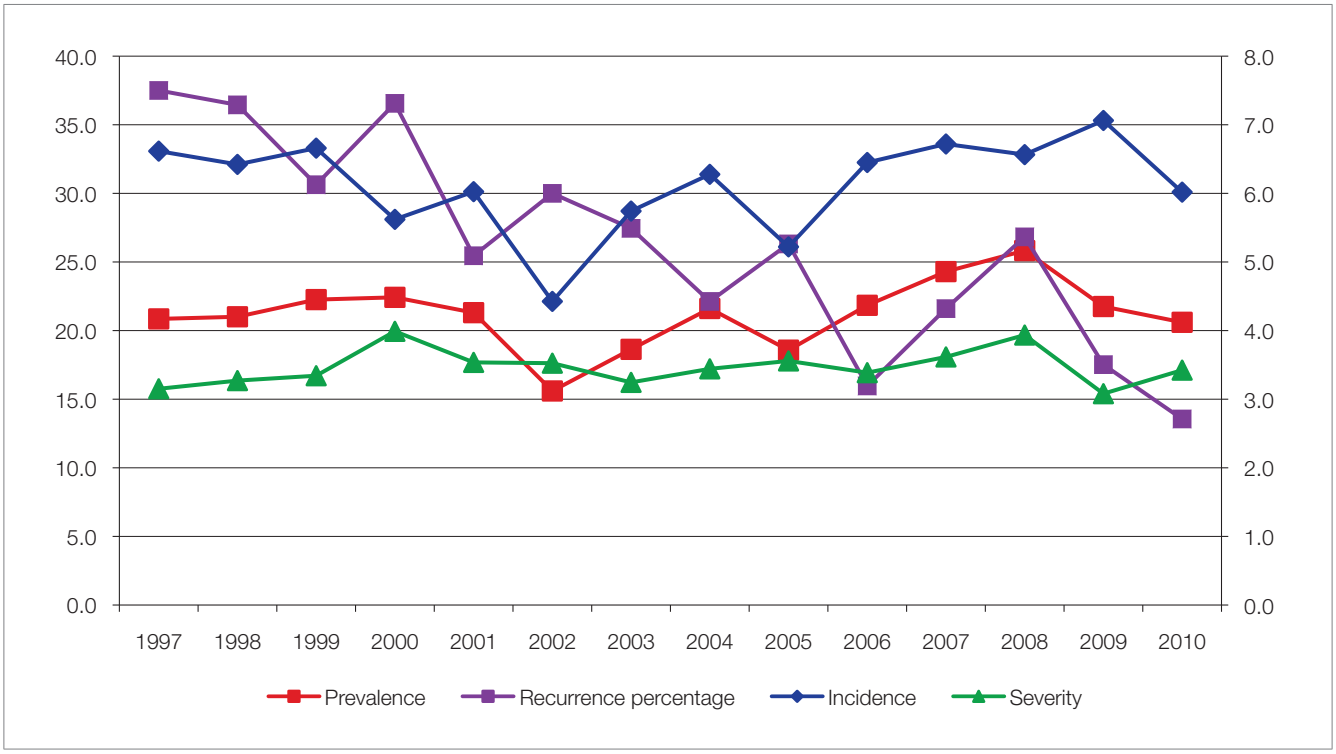
Hamstring injuries are the most common injury in the AFL and are responsible for the highest number of matches missed through injury[3]. The majority of hamstring injuries in Australian Football occur in matches although some occur during training sessions or by other means. Known risk factors include player age, past history of hamstring injury, strength deficits, indigenous race and past history of other injury (including calf, knee, ankle and groin injuries)[42–45].

Previous analysis of hamstring and other muscle strain data shows a high rate of recurrence[38,43,45–50]. The current AFL data shows that management of these injuries has become more conservative over the past decade in the AFL, with recurrence tending to decrease but prevalence and severity tending to increase (Figure 2). This change in management strategy has possibly been led by research showing that recurrence rates remain high for many weeks after the initial injury[46] and that performance of players is often decreased in the matches soon after return from hamstring strain[50]. Hamstring injuries are known to affect older players and those with a past history of injury more often[38,43,45–50] than other players.

Table 6 – Key indicators for hamstring strains over the past decade

Hamstring injuries	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 year average
Incidence	6.0	4.4	5.7	6.3	5.2	6.4	6.7	6.6	7.1	6.0	6.1
Prevalence	21.3	15.6	18.6	21.6	18.6	21.8	24.3	25.8	21.8	20.6	21.0
Severity	3.5	3.5	3.2	3.4	3.6	3.4	3.6	3.9	3.1	3.4	3.5
Recurrence rate (%)	25%	30%	27%	22%	26%	16%	22%	27%	18%	14%	23%

Figure 2 – Key indicators for hamstring strains over the past 13 seasons



Shoulder injuries

Table 7 shows a slight but steady increase in the rates of shoulder injuries over the past decade. In 2010, shoulder injury recurrence rates were the highest they have been on the ten-year record. It is possible that the increased number and ferocity of tackles during this period has contributed to the increased risk of shoulder injury. The increasing speed of the game facilitated through increased use of the interchange, combined with the subsequent increase in collisions and high intensity collisions may also be a contributing factor.

A research project is currently underway examining 1) the evolution of tackling in the modern game; 2) the potential impact this might be having on rates of shoulder injury; and 3) outcomes from past shoulder injury management including surgical outcomes.

In addition to the above, the other factor possibly contributing to the increasing trend in shoulder injuries is the greater tendency for teams to end a player's season somewhat earlier with shoulder reconstruction which is impacting on the observed rates of shoulder injury.

"In 2010, shoulder injury recurrence rates were the highest they have been on the ten-year record."

Table 7 – Key indicators for shoulder injuries over the past decade

Shoulder sprains and dislocations	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 year average
Incidence	1.1	0.9	1.3	1.0	1.4	1.6	1.0	1.8	1.3	1.6	1.3
Prevalence	5.4	5.9	5.7	5.9	7.7	10.8	6.4	10.2	7.7	10.9	7.7
Severity	4.9	6.7	4.4	5.9	5.6	6.7	6.3	5.8	5.7	6.9	5.9
Recurrence rate	10%	13%	9%	11%	20%	13%	16%	9%	12%	26%	14%

Knee ligament injuries

"There have been lower rates of PCL injuries since the introduction of the centre circle rule in season 2005, including zero centre bounce PCL injuries in 2010."

The two major knee ligament injuries, anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL), have shown slightly decreased injury rates in recent years (Table 8). There have been lower rates of PCL injuries since the introduction of the centre circle rule in season 2005, including zero centre bounce PCL injuries in 2010. There has certainly been a long-term decline in the risk of PCL injuries in ruckmen in the AFL[33].

"The use of LARS artificial grafts has contributed to the quicker return to play of some ACL injuries and lower prevalence."

Knee ACL injury incidence has been generally steady over the past few seasons (Table 8) although there was a lower reported prevalence in 2010. Not all ACL injuries in 2010 missed the remainder of the season, which is usually the case. Some (partial) ACL injuries were treated non-surgically and resulted in less missed time as a result. It is still too early to determine whether these grafts will have a good success rate in the longer term, but for circumstances where a quick return is paramount (e.g. older players), then LARS grafts appear to offer an alternative management which allows quicker return to play. Further surveillance and research is required before they can be recommended as a long-term alternative for younger players.

Table 8 – Key indicators for major knee ligament injuries over the past decade

Knee ligament injuries	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 year average
PCL incidence	1.0	0.4	0.5	0.7	0.4	0.3	0.2	0.3	0.3	**0.4**	0.5
PCL prevalence	5.9	2.3	2.0	6.5	2.7	1.8	1.6	2.2	1.2	**3.2**	2.9
Number of PCL injuries (total)	18	7	8	13	7	5	3	5	6	**8**	8.0
Number of centre bounce PCL injuries	4	3	2	5	1	0	0	2	1	**0**	1.8
ACL incidence	0.9	0.8	0.6	0.5	0.6	0.9	0.6	0.9	0.7	**0.6**	0.7
ACL prevalence	13.6	15.3	10.8	10.1	9.3	14.1	15.1	15.3	11.1	**7.8**	12.3
Number of ACL reconstructions using autografts	17	15	11	9	10	19	13	15	13	**5**	12.7
Pre-existing ACL injuries/non-AFL injuries	0	1	0	0	0	1	1	0	0	**3**	0.6
Number of graft ruptures	1	4	0	2	1	4	2	4	1	**0**	1.9
Number of LARS reconstructions	0	0	0	0	0	0	0	2	0	**4**	0.6
Partial ACL injuries	0	0	0	0	0	0	0	1	1	**2**	0.4

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Concussion

"The rates of concussion in the past decade are lower than those reported in the 1990s."

Table 9 shows consistently low incidence and prevalence for concussion (consistently fewer than one injury per team per season which causes a game to be missed). The rates of concussion in the past decade are lower than those reported in the 1990s.

The AFL's stance on reduced tolerance of head-high contact and stricter policing of dangerous tackles, along with the introduction of rules to penalise a player who makes forceful contact to another player with his head over the ball, has contributed to the low rates of concussion. Further tightening of these rules occurred prior to the 2011 season.

The AFL Injury Report definition of concussion is the one definition most frequently challenged in the context of only capturing those concussions which cause a week to be missed[36]. Any change to the definition of concussion for the survey would compromise the ability to detect long-term trends based on the historical data. There are reports from other codes of football where retired players concede that on some occasions when they received concussions they did not report the full extent of symptoms to team medical staff[51]. For this reason, trying to achieve a record of 'all' concussions for all teams would be very difficult. A separate study is being undertaken to monitor concussion in greater detail this year.

There is increasing concern about the potential cumulative impact of so-called 'minor' concussions, particularly in the sport of American Football[52]. However, return to play strategies in the AFL (including the majority of players not missing a game) have been validated as in line with best practice, included in the *American Journal of Sports Medicine*[53]. The AFL Medical Officers Association introduced new concussion guidelines at the beginning of the 2011 Season[54]. These guidelines promote a more conservative approach to managing concussion whereby a player diagnosed with concussion cannot return to the field.

In addition to the new concussion guidelines, there are two detailed research projects underway investigating a) the use of advanced neuroimaging techniques to help identify factors associated with more severe injuries and higher risks of complications; and 2) tracking the longer term outcomes in current and former AFL players who have sustained concussions.

Groin injuries

"Groin injuries... have a high rate of recurrence and a high rate of becoming chronic."

Groin injuries (including osteitis pubis) are consistently one of the three injury categories that cause the most missed playing time in the AFL. As a group, groin injuries represent a number of overlapping diagnoses, including adductor muscle strains, tendinopathy, osteitis pubis and sports hernias. In general these injuries have a high rate of recurrence and a high rate of becoming chronic.

Table 9 – Key indicators for concussion over the past decade

Concussion	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 year average
Incidence	0.7	0.7	0.3	0.3	0.7	0.3	0.3	0.4	0.5	0.5	0.5
Prevalence	1.3	2.0	0.6	0.3	0.9	0.3	0.3	0.5	0.7	0.8	0.8

Incidence appears to be quite constant from season to season (3–4 new injuries per club per season) but prevalence (missed playing time) and recurrence rates vary from season to season.

Injuries to this region may in fact be increasing slightly more than is appreciated by an analysis of the category of groin injuries. There is an increasing appreciation of the role of hip joint pathology in treating groin pain. A category of 'other hip/thigh region injuries' has gradually shown greater incidence and prevalence over the past decade. Although formal figures have not been kept, it appears that hip arthroscopy and femoro-acetabular impingement procedures have increased in recent years. Some of the so-called groin pain of previous years may actually have been due to hip joint pathology, so the actual rate of groin pain may be increasing at a higher rate than is appreciated.

AFL Photos.

Table 10 – Key indicators for groin injuries over the past decade

Groin injuries	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 year average
Incidence	3.5	3.8	2.9	3.1	2.9	3.3	4.1	3.2	3.3	4.1	3.4
Prevalence	13.6	15.7	13.7	13.3	11.2	14.0	18.0	12.4	11.7	15.3	13.8
Severity	3.9	4.1	4.8	4.4	3.9	4.3	4.4	3.9	3.5	3.7	4.1
Recurrence rate	20%	23%	20%	24%	23%	28%	38%	23%	19%	20%	24%
Other hip	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**10 year average**
Incidence	0.3	0.3	0.4	0.3	0.2	0.3	0.8	0.8	1.0	0.7	0.5
Prevalence	1.7	1.2	1.5	2.6	1.0	2.3	4.5	3.4	6.9	4.7	3.0

Relationship between increasing interchange use and injuries

"AFL overall injury incidence and prevalence have slightly but significantly increased over the last seven years."

AFL overall injury incidence and prevalence have slightly but significantly increased over the last seven years. Over this same time period interchange use by AFL teams has substantially increased. There appears to be an association between these factors however the relationship is complicated. An analysis carried out in 2010 further explored the relationship between injuries and interchange[55]. A statistically significant relationship was demonstrated between risk of injury and interchange using a logistic regression model (Table 11) as detailed overleaf.

Each interchange made by the *opposition* increases a team's risk of injury by approximately 0.8% (statistically significant relationship, P=0.005, 95% confidence intervals 0.3% to 1.4%) (Figure 3 overleaf). Each interchange made by the team itself (in the previous week) decreases their risk of injury by 0.4% (strong trend, P=0.13, 95% confidence intervals +0.1% to -1.0%). This logistic regression model did not find game continuity (as measured by length of the game/percentage of time in play) to be a significant predictor of injury, suggesting that the increases in injury rates in recent years were related to interchange use rather than changes in game continuity.

Although this described link does not fully explain the underlying mechanisms, a simple paradigm which is consistent would be that a player who has just come onto the ground having been interchanged is temporarily less likely to get injured (because he is rested) but his direct opponent is temporarily more likely to get injured (as he is a fatigued player competing against, and trying to run with, a rested player).

AFL Photos.

There are further consequences of this complex relationship, apart from the increase in injuries for the competition as a whole. There is now a strong incentive for clubs to continue to increase their interchange movements in an 'arms race', because they have perceived (correctly) that there are advantages to making more interchanges than the opposition. This advantage extends to a lower rate of injuries relative to the opposition (Figure 4).

There is also an increased consequence to a team of an injury occurring during a game. Not only does the injury decrease a team's chance of winning that match, but it also restricts the number of interchange rotations that can be made, furthering the likelihood of other injuries.

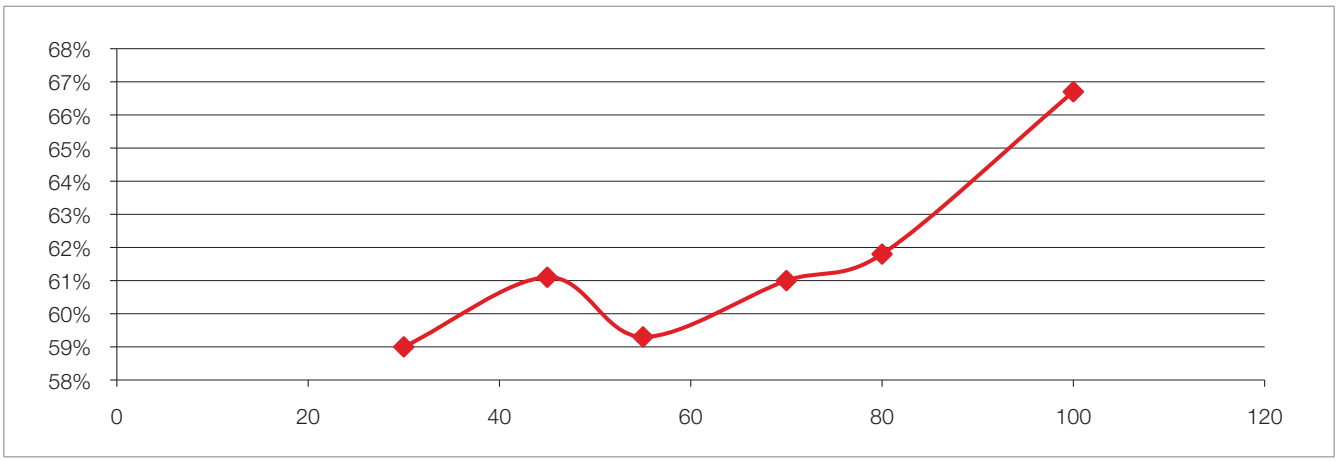
In addition to the above research, a number of other studies were undertaken to address questions that had been raised throughout the Laws of the Game consultation[59–64]. Four independent reviews of the methodology used in the research were also commissioned[65–68]. Both the further research and the reviews fortified the initial concerns.

"...if left unchecked interchange would take player speed and congestion to a new level..."

Although direct cause and effect could not be proven, the evidence available suggested that if left unchecked interchange would take player speed and congestion to a new level and there remained concern about potential further increases in collision injuries.

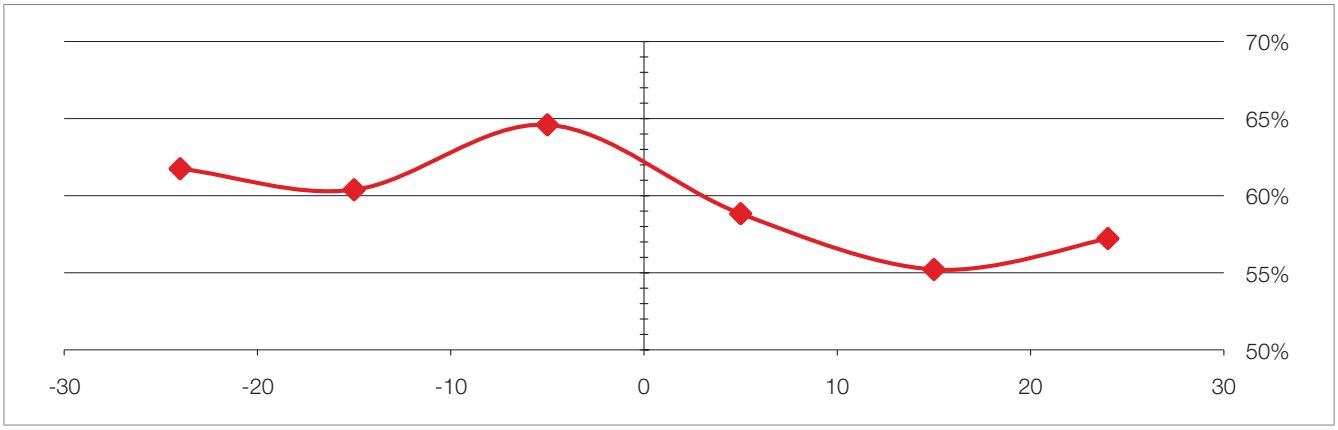
After extensive consultation over a four-year period and throughout 2010 involving clubs, coaches, players, club medical officers, physiotherapists and fitness staff[56–58], the AFL announced that the interchange would be reduced from four to three players, and that a substitute player would be introduced for the 2011 Season.

Figure 3 – Risk that there will be an injury for each AFL team squad each week (22 players) based on opposition team number of interchanges made in the match (2003–10 data for home and away season rounds 1–21)*



* Round 22 not included as it is less likely that a player will miss a match because some teams end their season.

Figure 4 – Risk that there will be an injury for each AFL team squad each week (22 players) based on differential number of interchanges made between own team (previous week) and opposition (current week) (seasons 2003–10, rounds 2–21)



* The previous week is used for own team interchange count because of the confounder that a low number of interchanges is itself a marker of an injury having occurred. Round 1 is also excluded (compared to dataset in Figure 3) as there is no previous week's match to include.

Table 11 – Logistic regression model for AFL team risk of suffering at least one injury (i.e. player misses the following week) from a game (seasons 2003–10, rounds 2–21)*

	B	S.E.	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
					Lower	Upper
Effect of each interchange made by the opposition	.008	.003	.005	**1.008**	1.003	1.014
Effect of each interchange made by the team in the previous week	-.004	.003	.133	**.996**	.990	1.001
Constant	.181	.088	.039	1.198		

* The previous week is used for own team interchange count because of the confounder that a low number of interchanges is itself a marker of an injury having occurred. Round 1 is also excluded (compared to dataset in Figure 3) as there is no previous week's match to include.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Snapshot

- Overall a higher injury incidence and prevalence in season 2010 compared with season 2009, which is a continuation of a consistent but gradual upwards trend in both injury incidence and prevalence since 2003.
- The 'average' status of a club list of 46 players in any given week includes eight players missing through injury. This is an increase from six in 2003–05 and seven in 2006–08.
- The number one injury in the game remains the hamstring strain. Incidence and prevalence rates of this injury remain high. The 2010 figures were slightly down from 2009 but were consistent with the long-term averages. A recurrence rate of 14% for hamstring strains in 2010 was the lowest rate recorded.
- Rates of concussion have been low and steady over the past decade. The AFL Medical Officers Association introduced new guidelines for the management of concussion at the beginning of the 2011 Season. The guidelines promote a conservative approach to managing concussion whereby a player diagnosed with concussion cannot return to the field.
- The most severe of the common injuries is still the knee anterior cruciate ligament (ACL) tear, with slightly lower rates in season 2010 compared with recent seasons. In particular, prevalence (missed time) for ACL injuries was down in 2010.
- Other studies related to the injury survey have reported that interchange use, player speed and tackling have increased similarly to injuries in recent seasons. Research undertaken in 2010 demonstrated that each interchange is beneficial (from an injury risk viewpoint) for the team that makes it, but is harmful for the opposition team.
- The trend in centre bounce PCL injuries has continued to remain at record low levels following the introduction of the ruck rule in 2005. In 2010 there were zero PCL injuries from centre bounces and there have been only four in total since 2005.

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Associate Professor John Orchard

Adjunct Associate Professor, University of Sydney

Dr Hugh Seward

Executive Officer, AFL Medical Officers Association

The full report, detailing the methods used, is available at www.injuryupdate.com.au/images/research/AFLInjuryReport2010.pdf

References, as indicated within the article, are available at sma.org.au/publications/sport-health/

Paper vs internet for follow up

Vox pop

SMA took to the streets to ask members their opinions on the following question:

What do you see as SMA's role in the sports medicine industry?

"SMA is an important umbrella organisation, important in research and education for all those involved in sports medicine."

Professor George Murrell, Department of Orthopaedic Surgery, St George Hospital, NSW

"I see SMA as an umbrella organisation that encourages cross-disciplinary interactions (e.g., between physios, psychologists, sport scientists, podiatrists, nutritionists, and medicos). With the multidisciplinary involvement and support, SMA also represents greater numbers than any single subdiscipline could manage on its own, thereby increasing the strength of members' voices in the political arena."

Stephanie J. Hanrahan, Sport and Exercise Psychologist, The University of Queensland, QLD

SPORTS MEDICINE AUSTRALIA

Victor van den Berg and sports physician Dr John Orchard compare the methods of paper mail out and internet for clinical follow-up of sports medicine patients.

A patient survey is one way to assess the success rate for medical procedures. There are various methods for trying to achieve high follow-up rates, but there is no consensus that one particular method is universally superior to others. Since more and more people are using the internet, the usefulness of this as a survey method needs to be further investiged.[1] Using the internet for data collection has some obvious advantages, i.e. can potentially be cheaper (particularly when the number of participants is high), can give faster results, collected data can be transferred directly to a statistical program, and the questionnaire can easily be adjusted if needed. However one of the most important features of any mode of data collecting is the response rate and those of the internet have not yet shown to be superior to those of the traditional paper questionnaire.

"The assumption that people get more and more comfortable with the use of the internet...seems to be wrong."

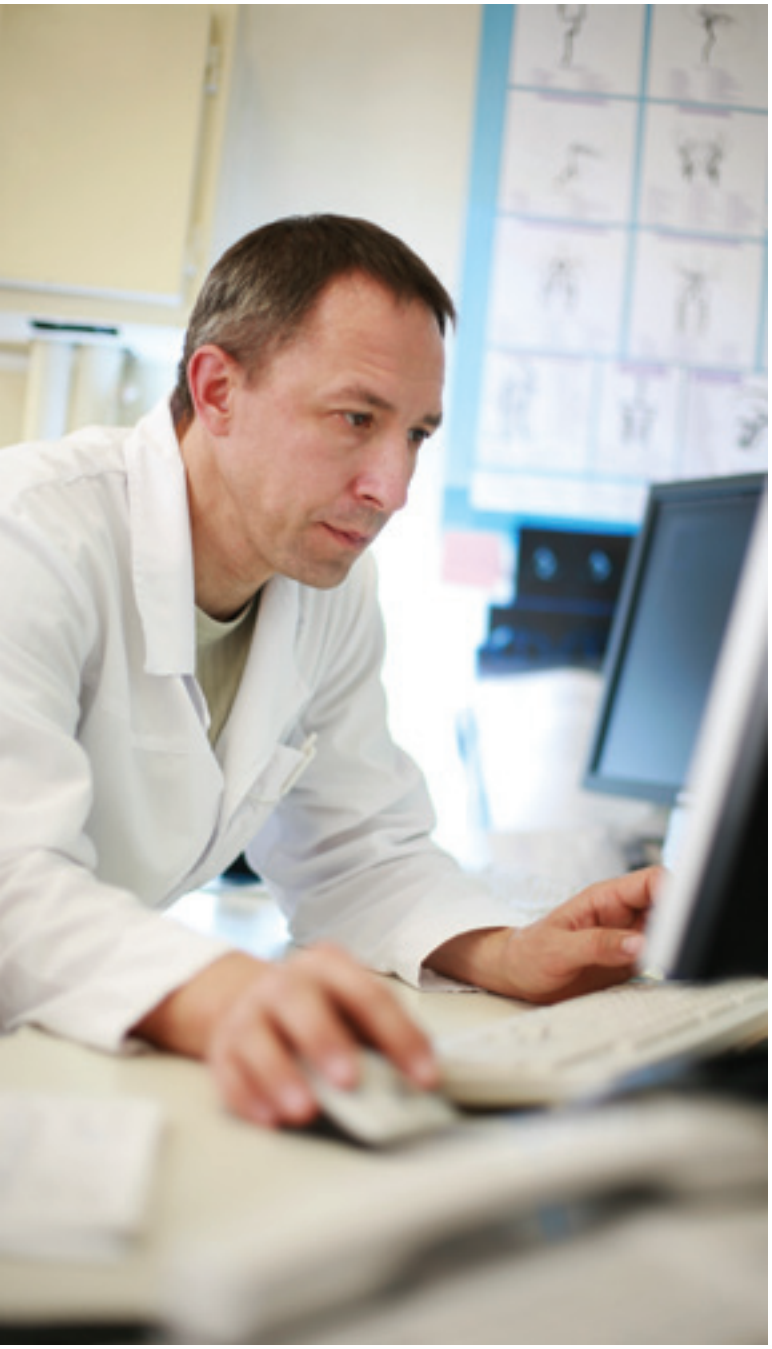
Study results comparing web and paper surveys published from 1995 to 2005, showed an overall response rate for web surveys of 34% compared to a 45% response for paper surveys.[3] These studies were observing the response rates in various settings and populations with different research goals (not all medical). The analysis also found some other interesting statistics. The assumption that people get more and more comfortable with the use of the internet, which would possibly lead to an increase over time of web survey responses, seems to be wrong. The publication year did not significantly influence the difference in response rate between web and paper survey. Further, the researchers found that a follow-up reminder is significantly more effective for mail surveys. Comparative studies without reminders found a difference in response rate of 4% in favour of mail surveys. In studies that did use follow-up reminders this difference was 14%.

Because neither internet nor paper surveys alone obtains very impressive response rates[3], it is common to use mixed-mode designs for surveys.[4] Mixed modes are used to increase the response rate and to reduce an over or under representation of a certain group in society, i.e. the various modes compensate for each other's weaknesses.[4,5] For example, it has been found that the college population is more likely to respond to an internet survey instead of a paper one while the rest of the population is more likely to respond to a paper questionnaire.[3]

"We hypothesized that an internet survey in a sports medicine clinic population would have a higher response rate than a traditional paper questionnaire."

By giving the interviewee a choice in how they will answer, it is more likely that their favourite mode is available and thus they will answer and thereby more valid results will be obtained. A comparative study mixing letter questionnaires and web questionnaires among physicians evaluating the Electronic Medical Record found the overall response rate grew from 57.4% to 70.5% for the mail/web combination and from 46.9% to 62.9% for the web/mail combination.[2]

Despite the fact that internet surveys have yet to be proven to generate higher response rates, using the web does have advantages (some of which have been stated previously). Further to these, patients attending sports medicine clinics may differ from the normal population. They are perhaps more likely to be younger and professionals or students.[7] Since sports medicine clinics in Australia are private, out of pocket costs bias the population of patients to upper socioeconomic groups. We hypothesized that an internet survey in a sports medicine clinic population would have a higher response rate than a traditional paper questionnaire.



The study

We aimed to compare the success rate (particularly in terms of response rate) of a paper questionnaire to a web-based questionnaire. Study patients were those who had received ESWT (Extracorporeal Shock Wave Treatment) at South Sydney Sports Medicine clinic for a sports medicine condition. The majority of patients had been treated for calcific insertional Achilles tendinopathy or plantar fasciitis (treated by author John Orchard).

There were two groups of patients. One group was recruited prospectively to receive either an email or mailout (or both) asking them to report on their progress. A pilot trial on a group of historical patients was also started. Only the mail address details were known for these patients so they were sent a paper questionnaire with the offer that they could answer it and return it in a pre-paid envelope or answer it online at a website.

The questionnaire designed for this research contained six questions about injury and what effect the patient felt the treatment had on that injury. The estimated time for completing the questionnaire was less than five minutes. The paper questionnaire was mailed out to the last known address of the patients, along with a participant information statement and a pre-paid envelope. A professional web design company was engaged to design a web page for data entry, with a question format identical to the paper questionnaire, along with an ID and password entry. All patients had four weeks to respond.

"...paper-based administration was far more successful than the web-based administration."

The results

The paper-based administration was far more successful than the web-based administration. In total only 3 surveys were completed through the website versus 87 completed surveys received by mail. Table 1 shows a breakdown of the response rates. When solely looking at the method of response for those who did respond, paper-based responses compromised 96.7% of surveys received, compared to 3.3% for the internet-based administration.

Table 1 – Summary of response rates

	N	Responses			Response rate
		Internet	Mail	Total	
First pilot	212	2	67	69	32.6%
Second pilot	50	0	11	11	22.0%
Prospective mixed mode study	22	1	9	10	45.5%
Total	284	3	87	90	31.7%

Table 2 – Comparison of response rates

Variable	Overall distribution	Excluding non delivered	Responses through mail	Responses through internet	Total responses
	n=290	n=284	n=87	n=3	n=90
Age (%)					
</= 30	15 (5.2%)	15 (5.3%)	1 (1.1%)		1 (1.1%)
31–40	32 (11.0%)	32 (11.3%)	4 (4.6%)	1 (33.3%)	5 (5.6%)
41–50	67 (23.1%)	66 (23.2%)	22 (25.3%)		22 (24.4%)
51–60	84 (29.0%)	81 (28.5%)	26 (29.9%)	2 (66.7%)	28 (31.1%)
61–70	67 (23.1%)	66 (23.2%)	24 (27.6%)		24 (26.7%)
70+	25 (8.6%)	24 (8.5%)	10 (11.5%)		10 (11.1%)
Gender (%)					
Female	152 (52.4%)	149 (52.5%)	45 (51.7%)	2 (66.7%)	47 (52.2%)
Male	138 (47.6%)	135 (47.5%)	42 (48.3%)	1 (33.3%)	43 (47.8%)
Injury (%)					
Achilles tendinopathy	92 (31.7%)	91 (32.0%)	26 (29.9%)	2 (66.7%)	28 (31.1%)
Plantar fasciitis	148 (51.0%)	145 (51.1%)	41 (47.1%)	1 (33.3%)	42 (46.7%)
Other	50 (17.2%)	48 (16.9%)	20 (23.0%)		20 (22.2%)
Years of treatment (%)					
2006	51 (17.6%)	50 (17.6%)	11 (12.6%)		11 (12.2%)
2007	60 (20.7%)	59 (20.8%)	18 (20.7%)		18 (20.0%)
2008	63 (21.7%)	61 (21.5%)	20 (23.0%)		20 (22.2%)
2009	89 (30.7%)	87 (30.6%)	28 (32.2%)	2 (66.7%)	30 (33.3%)
2010	5 (1.7%)	5 (1.8%)	1 (1.1%)		1 (1.1%)
2011	22 (7.6%)	22 (7.7%)	9 (10.3%)	1 (33.3%)	10 (11.1%)

In order to assess if there was a non-response bias, we compared age, gender, injury and the year of treatment of the respondents to those characteristics of the total study group. The results are presented in Table 2. No bias was found for gender or type of injury but there was a significant difference in age. The respondents were on average older than the total group with a significant difference if the group of cases '40 and younger' is compared with the group of cases '40 and older'.

Even though it was not the primary objective for this study to assess the success rate of the ESWT, the results are presented in Table 3 (overleaf). There was no significant difference in success rates for the different injuries. Almost 40% of the respondents claimed that the ESWT definitely made them better or even cured them. Overall about 23% would definitely not do the treatment again if they had the same condition. There was only one claim of being worse off as an effect of the treatment.

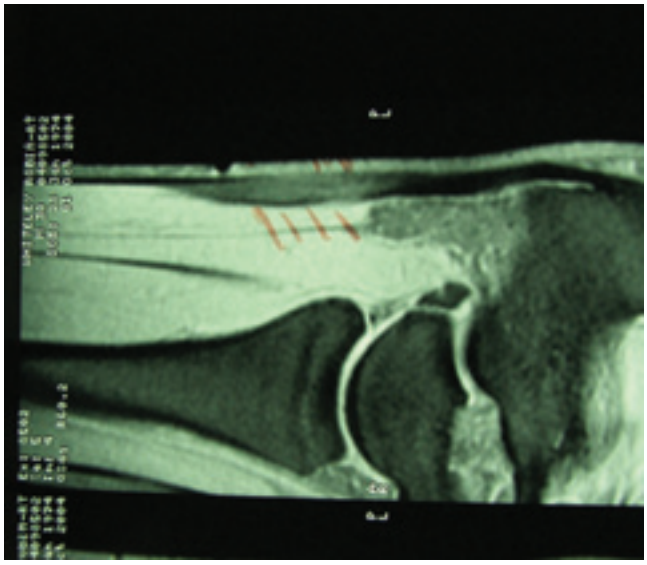


Table 3 – Summary of impression of value of ESWT

Question: How are your symptoms now compared to just before your first treatment?							
	Cured	Cured, reduced exercise	Much better	Slightly better	Similar	Slightly worse	Much worse
Responses	26 (28.9%)	15 (16.7%)	24 (26.7%)	8 (8.9%)	13 (14.4%)	3 (3.3%)	1 (1.1%)
Question: How much exercise/activity are you now able to do?							
	Exercise fully	Exercise with mild limitations	Only restricted exercise				
Responses	28 (31.1%)	41 (45.6%)	21 (23.3%)				
Question: What is your impression of the value of the treatment in helping treat your condition?							
	I am sure that it completely cured me	I am sure that it made my condition better	I think it made my condition better	It did not make my condition better/worse	I think it made my condition worse	I am sure it made my condition worse	
Responses	17 (18.9%)	19 (21.1%)	24 (26.7%)	29 (32.2%)	1 (1.1%)	0 (0%)	
Question: With the benefit of hindsight, would you have the treatment again for the condition?							
	I would definitely do it again	I would probably do it again	I might but I am not sure if it helped	I would not because it did not work	I would not because it might have made it worse		
Responses	37 (41.1%)	15 (16.7%)	17 (18.9%)	20 (22.2%)	1 (1.1%)		

The reasons why

In our study the postal survey turned out to be far more successful than the internet survey. However, there were problems with the internet survey website being offline right after delivery of the survey during the first pilot, but even in both the second pilot and in the prospective mixed-mode study the website was barely used.

We hypothesized that the internet would yield superior results in a sports medicine population. After reading the available literature we became less confident but we did not suspect that our web-based response rate would be so poor.

The response rate generated by the paper-based administration was just 30.6% which is substantially lower than the 45% response rate reported for paper surveys.[3]

The primary failure in this study was a catastrophic website error. Whilst it would be easy to dismiss this as being an error that 'should not have happened' and therefore should not be reported on, the potential for a website to 'crash' is ever present and in this case it severely affected our study results.

"...an email may: be less highly rated than a letter, be deleted as it was thought to be spam, be less noticed in an array of emails in an inbox, not evoke the same obligation of 'return', not be as 'trusted'..."

The website failure may have also affected the response rate for the paper-based survey, since some patients who tried to log into the website and found the site down probably did not bother to return a paper questionnaire in lieu. However there may be other explanations for the poor response rate. For example, an email may: be less highly rated than a letter, be deleted as it was thought to be spam, be less noticed in an array of emails in an inbox, not evoke the same obligation of 'return', not be as 'trusted', i.e. people are more aware of the hazards of the internet and may be less likely to complete internet surveys.

Although we hypothesized that sports medicine patients may be more likely to reply to an internet survey than a paper-based one, perhaps our choice of treatment (ESWT) did not reflect the 'average' sports medicine patient. The vast majority of patients suffered from calcific Achilles tendinopathy or plantar fasciitis and the average age was over 50.

We not only found that these patients preferred paper surveys but also that older patients had a higher response rate than younger patients.

One further weakness in our study was that we did not send out any reminders which have been a proven effective way to significantly raise the response rate, especially for paper-based administration.[3,10] We did not feel that it was fair, in the circumstances, to follow up non-respondents when a major reason for the non-respondents was that the website we designed had crashed, particularly when the primary research question had been answered (i.e. that paper questionnaires were clearly showing superior results).

"Web surveys could be completed far more cheaply using a generic survey site like *Survey Monkey* or *Zoomerang,* however these websites are not designed with medical confidentiality in mind."

Because of time constraints, we perhaps did not allow enough time to receive all surveys, although it is likely that if any replies are received after the closing date that these will be paper surveys rather than surveys completed online. In a paper comparing the response rate and time of an email and a postal mail survey an average response time of 33 days was reported for the first mailing.[8] Another proven way to increase the response rate is to notify participants before sending out questionnaires. In our study we only did this in our prospective mixed-mode group who were asked to participate during their treatment. According to the Cochrane review, the odds of response are increased by half if participants were notified up front.[10]

In contrast to the results found in other studies, in our research the mail arm turned out to be a lot cheaper than the internet arm. The main reason for this was the size of our study cohort. Initial high development costs of the website were split among a small group size which made the costs per outgoing invitation a lot higher as compared to the internet survey. There would also be monthly maintenance fees to keep a custom-made website online. Web surveys could be completed far more cheaply using a generic survey site like *Survey Monkey* or *Zoomerang,* however these websites are not designed with medical confidentiality in mind.

Both the internet survey and the postal survey did not reach an acceptable response rate (>=70%). With the low response rates observed (1.1% for internet and 30.6% for postal) the results when considering patient satisfaction rates may not be reliable.

Even though we did not reach the follow up rate we hoped for, the results of the survey shows that the patient satisfaction rates for ESWT seem to be good. Over 65% of the patients stated that their injury was improved by the treatment and almost 20% of the patients were even sure that they were completely cured by the shock wave treatment. The treatment is mostly used for treating plantar fasciitis and (calcific) Achilles tendinopathy. Both are complex and not well understood injuries. There is often little explanation about why one person gets the injury and the other does not. Also the best treatment is not clear with different people responding different to a range of offered treatments.

Victor van den Berg

Dr John Orchard

References, as indicated within the article, are available at sma.org.au/publications/sport-health/